HOW TO BUILD

A

MOTOR LAUNCH

BY

C. D. MOWER

Price $1.00

NEW YORK AND LONDON
THE RUDDER PUBLISHING COMPANY
9 Murray Street and 143 Strand, W. C.
1901

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Introduction

THE motorboat is destined to play a prominent part in the future development of the world. For years man has talked of and longed for a compact, safe power that could be utilized to drive a craft of small dimensions, to take the place of the oar and to relieve him of the irksome toil of rowing. Steam refused even in the hands of the most ingenious to adapt its power to this purpose. This powerful agent when employed in small boats proved to be a wasteful and somewhat dangerous servant.

In the motor driven by the products of petroleum man has at last found what he has so long waited and toiled for—a safe, economical and trusty engine. It is especially adapted to the propulsion of craft, such as are too small for steam and too heavy to be rowed.

Throughout the world, and remarkably so in this country, there are many bodies of water—lakes, rivers and ponds—that are not navigable by sail-craft, owing to their being surrounded by high banks or having rapid currents. On these waterways until of late years nothing could be used but rowboats. It is for voyaging in such waters the motor boat is particularly adapted.

We have had a constant call for a book of plans for a boat of this description, an easy-to-build, cheap craft, yet one that would look well and run well. This is our reply to that demand, and so far as I can judge the boat herein outlined will prove, if properly built, a handy and speedy craft. While keeping to the fundamental idea of designing a boat of simple construction we have not sacrificed either strength or seaworthiness, and have besides managed to produce a vessel that is decidedly shapely—one that it will be a pleasure to look at when afloat.

To the man who has already some experience in building there is nothing for me to say—the plans are all he will need. But to the man who has never built a boat before, let me say this, do not attempt to alter or, as some express it, *improve* upon the plans. Build the boat as here designed, or leave it alone. You cannot change the shape or construction of this launch, and get a satisfactory result. If you think you can, then take my advice and build a boat wholly from your own plans, and not from a distorted conception of ours.

In building a boat for the first time you will meet with many hard problems, and encounter difficulties that are tiresome to overcome; but don't bother about these until you come to them. Sufficient the task you are at, and let the future one to be taken care of when you arrive at it. Don't be in a hurry, don't grow impatient. Stop and think before you drive a nail, or push a plane, or shove a saw, if what you are about to do is right, and you will save wasting a lot of time and material. Be sure before you go ahead that you thoroughly comprehend the directions. If you don't, then get somebody who does to explain it to you, or, better, sit down and think the question out for yourself. The principal thing in a launch is to have your engine properly placed and bedded. It must stand firm as a rock, and be exactly in the center, so that the shaft will be perfectly true. Also, be careful to make all fastening in the after part of the boat thoroughly strong. A motorboat with weak stern framing will be a constant source of annoyance.

We do not recommend any particular make of engine. You must use your own judgment to select from those on the market a suitable motor for your craft. But when you have finished your boat we will be glad to have you send us a picture and to hear from you how it turns out.

How to Build a Motor Launch

IT is my intention in this book to take a launch of simple design and easy construction and go through all the stages of construction from laying the boat down to the final finishing touches when the boat is complete and ready for use. I shall touch but lightly on the subject of engines and power, but will try to show the proper methods of putting in the foundations for the machinery and for doing all the other necessary boat builder's work in connection with it.

My plan is to take up one design and explain the construction so fully that the amateur will gain sufficient knowledge of the methods and practices in boat building as to enable him to take any design which he may have and build a boat from it which will be a well-constructed and serviceable craft. I have selected a twenty-foot launch as the size of boat on which most amateurs will probably want to make their first attempt.

The dimensions are as follows:

Length over all	20	feet	0	inches
" water line	18	"	6	"
Beam extreme	5	"	4	"
" at water line	5	"	0	"
Freeboard at stem	2	"	7	"
" " stern	1	foot	6	"
" least	1	"	4	"
Draught extreme	1	"	6	"
" to rabbet	1	"	0	"

This launch will prove a stiff, steady and able boat that will drive easily at good speed, and be perfectly safe even on open and exposed waters in any weather that one is liable to get during the yachting season. The engine will be placed amidships, with a cockpit both forward and aft of it, in order to simplify the construction and also to make a faster and more able sea boat.

Any intelligent person who is accustomed to boats will be able to see the features of the design by looking over the drawings, so I will consider further description as unnecessary.

SHOP AND TOOLS

First, we must have a shop to build the boat and do our work in, and, if possible, let us have a dry, warm one, with plenty of light and a good, solid, level floor. A little extra time and labor in getting a good shop will enable you to do your work much better and with far more comfort, and the results will be very much more satisfactory than you can possibly get if you try to work in a cold, poorly-lighted shed, under a roof that leaks badly every time it rains.

We must have room for our boat, with plenty of space to work all around her, a good, solid bench, long enough to work the planks on, and a stove for heating and to furnish steam for our steam-box.

The bench should be about 22 or 24 feet long, from 20 to 24 inches wide and 2 feet 8 inches high above the floor. It should have a heavy and strong framework and be well fastened to the side of the building. The top should be of two-inch plank. At the left-hand end we will need a vise of some kind, and I would recommend a strong wooden one, with a good iron vise at the opposite end of the bench. If we think we can afford only one, then let us choose the iron one, as that will be found most useful for many things. The necessary tools are not many in number, but must be of good quality, as inferior tools are the poorest investment a man can possibly make. It is true that "it is a poor carpenter who finds fault with his tools," but if you buy good tools you will never have occasion to find fault with them, so will never be called a poor carpenter.

I will give a list of the ones I consider necessary, but feel sure that the list will be added to from time to time, for my experience has been that when I get in a hardware store and see some nice piece of kit that takes my fancy I usually can't resist buying it.

The list is as follows: Clawhammer, small riveting hammer, rip saw about 22 inch with 12 teeth to the inch, cutting-off saw same size, smoother plane, small block plane, a draw-shave about 6 or 8 inch, spoke-shave, ratchet bit stock, screwdriver for bit stock and bits of various sizes, to be bought as needed; hand screwdriver, try square, chisels ¼-inch, ½-inch and ¾-inch, two-foot rule, 6-inch compasses, cutting nippers, spirit level, plumb bob and line, and say six iron screw clamps of about 4 or 5 inches opening.

For riveting you will need a burr set to drive the burr

down over the nail into place, and an iron with a projection to hold against the head of your fastening while riveting. I would recommend making a good strong box to keep your tools in, as I consider it a much better plan than having them scattered about the bench, in racks or drawers.

For a steam-box we must make a rough box about 6 x 10 inches, about 8 feet long, out of ⅞-inch boards. It must be very well nailed along the edges, so that the steam will not escape badly. One end must be closed, and the other left open to receive the material to be steamed. This end may have a door on hinges, but the usual practice is to stuff it with old rags. An ordinary teakettle over a good fire will supply sufficient steam, and should be connected with the box by a piece of rubber tubing or garden hose. The box is usually suspended over the stove in such a position that wood taken from it may be very quickly put in place on the boat.

LAYING DOWN

When the shop is ready we can begin our work of laying the boat down, which means simply enlarging our plans to full size to make our moulds and patterns from. If the shop has a nice, clean floor the work may be done on that, but, if it has not, the best plan is to get some new pine boards and lay a temporary floor to do the work on. This floor should be about 22 or 23 feet long and 5 or 6 feet wide.

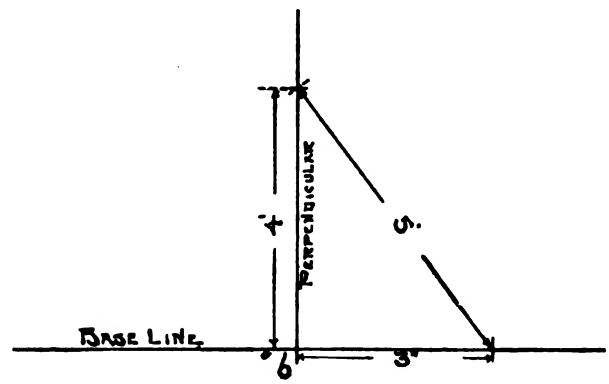
First, near the lower edge of the board, strike a line with a chalk-line, to be used as a base line from which to get the heights at the different stations. After striking in this line it will be well to put it in heavily with lead pencil, so that it will not become erased and lost as we work over it.

Two feet above this line strike another parallel with it to represent the load water line. Next draw, at right angles to these two lines, the different stations, spacing them exactly two feet apart and numbering them as they are shown on the plan.

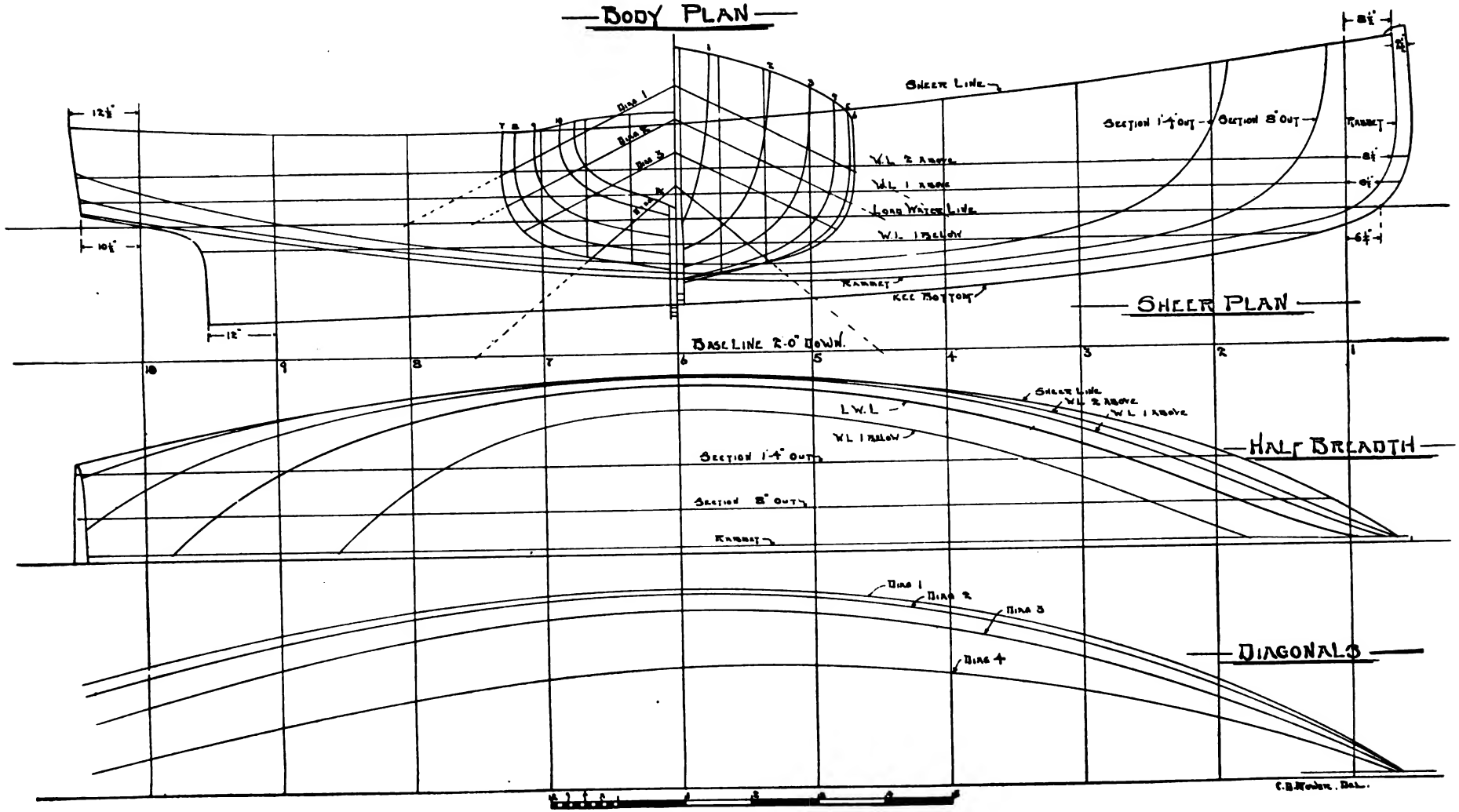
All these lines had better be put in with lead pencil also. The best way of drawing these stations is to first erect a perpendicular at No. 6, and prove that it is exactly square with the base line by measuring off three feet on the base line and four feet on the perpendicular. The distance between these two points should be exactly five feet if the perpendicular makes a right angle with the base line. When this line is drawn you can by careful measuring make the others exactly parallel with it at spaces of two feet.

Now we are ready to lay down the lines of the boat, and we will start with the sheer plan, or profile, taking first the sheer line.

Now we refer to the laying-down table, the figures of which give the dimensions of the boat in feet, inches and eighths; find the line of figures marked "sheer line," and on each station lay off the distance given, measuring up from the base line. Then take a long strip of pine about half an inch thick and two inches wide, with one edge perfectly straight and showing no unfair places, and lay it flatwise on the floor, bending it so that the fair edge will just strike through the points we have laid off, and fastening it in place either with wire nails or by long awls with wooden handles. The awls are usually used and are most convenient. The batten should make a perfectly fair and true sweep through all the points; but, in case it does not strike exactly through them all the draughtsman must use his judgment in allowing it to go just a bit inside or outside of the point, as the case may

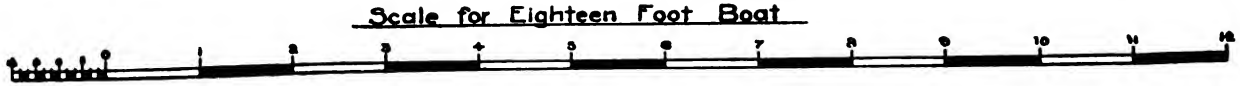


be, so that it will make a true curve. This is what is called "fairing up," and has to be done to a certain extent all through the work of laying down, as it is almost impossible to take the measurements from a small drawing so accurately that no error will appear when it is laid off full size. After the sheer line is in you can lay down the keel bottom, rabbet line and the outline of the stem in the same way by taking the measurements from the table. For drawing the turn of the forefoot at the stem you will need a much smaller batten, which should also be made of pine and planed thin enough to bend to the required curve easily and without danger of breaking. Next lay down the half breadth of sheer line, using the base line as a center line. At first it may seem a bit confusing to draw one plan over another in this way, but it is the usual custom, being done to economize room, and with a little thought will lead to no mistakes. When the sheer line is in, then strike in the load water line.

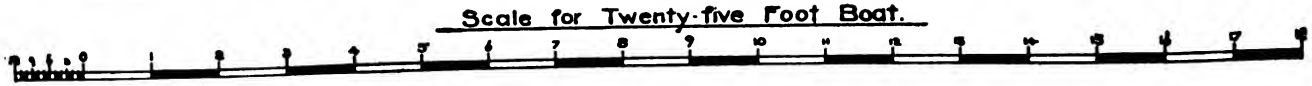


LINES OF TWENTY-FOOT LAUNCH

Scale for Eighteen Foot Boat



Scale for Twenty-five Foot Boat.



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using a smaller batten—probably one about ⅞ x ⅞ inch—and fairing up any points that need it. Next lay down your diagonals in the same way, using the load water line as a center line, so that they will not become hopelessly confused with the half-breadth lines.

The dimensions for each line on every station will be found on the laying-down table, and they must be very carefully and accurately laid off on the floor.

In general, regarding battens, you should use one as stiff as will bend nicely through the required points, and where a line has a sharp curve at any part use a smaller batten for that part of the line. Battens with one end tapered are sometimes used, but I would not recommend them for the amateur. The best wood for battens is pine; they should be carefully selected, straight-grained and free from knots or sap. It is, of course, of absolute necessity that there should be no short curves or kinks in them, but a long fair curve or sweep in them will be unobjectionable. The batten should always be long enough to extend well beyond the end of the line you wish to draw, and the awls which hold it in position should be placed out to the very end, for, unless you do this, your line will have a straight and unfair place near its ending. An experiment with a batten will show this very quickly.

When all your long fore-and-aft lines are drawn on the floor and show perfectly fair curves throughout, you are ready to start on your body plan. This can be drawn over the sheer plan, using Station 6 as the center line. First draw the diagonals as they are shown on the drawing, being very careful to get the points where they intersect center line and water line very accurate.

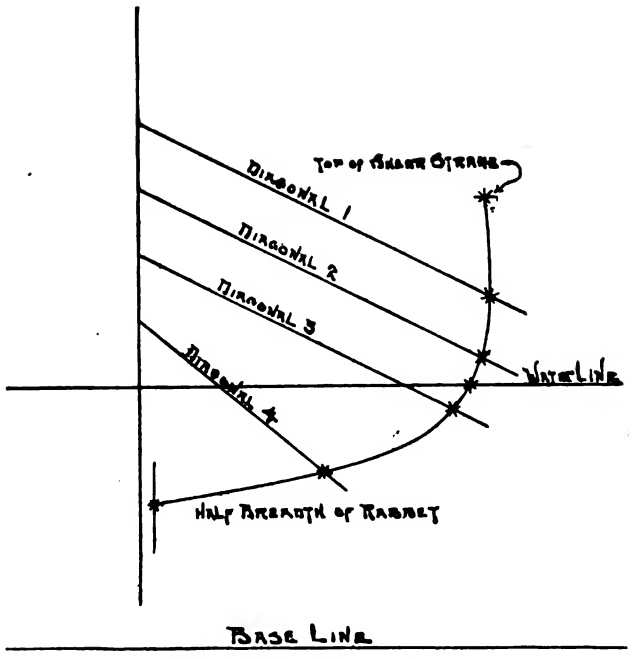
First we will take the midship section, No. 6. On a light piece of pine mark the exact half breadth of sheer line and water line from your half-breadth plan, and transfer the points to your body plan, marking the point on the water line, and also at the height of the sheer. Next get the exact height of sheer above the base line, and make a mark intersecting the one showing the half-breadth. The intersection will denote the ending of the midship section.

One inch and one quarter each side of the centre line draw a line to represent the rabbet line, and on this mark the exact height at which the rabbet line of the sheer plan intersects Station 6. This gives us three points for our midship section, viz., upper ending, lower ending and width or load water line. Now with our little measuring stick we will take the widths of the diagonals from the center line from which they were drawn, and transfer each point to the corresponding diagonal on the body plan, measuring from the intersection of diagonal and center line, along the diagonal and marking the point where the section line should cross it. This gives us four more points for our midship section, making seven in all.

Now with a nice, true little batten, about ½ x ⅛ inch, strike a line through these points, and we have our midship section drawn in. In case any discrepancy arises and the batten will not take a fair curve through all the points, it will be best to hold our diagonals and change the water line points by fairing the water line until all agree nicely. Proceed the same way with the other sections, omitting Nos. 1 and 10, as it will not be necessary to make moulds for those stations. The idea of running in the diagonals and other lines full length at first from the tables, and then taking the points from them for the body plan, is to make sure that they are absolutely fair, so that when the plank is put on over the moulds the boat will be perfectly fair and show no bunches or hollow places, as it might if we trusted wholly to the accuracy of our original design and laying-down tables, and laid down only the body plan direct from the table of measurements. Then, of course, we need the sheer plan to get the exact length and shape of the keel, stem and deadwoods, position of shaft log, etc. It must be remembered that the lines we have drawn all represent the outside of the planking of the boat, so before making our moulds from the body plan we must strike another line just ¾ of an inch (the thickness our planking is to be) inside of the sections we have already drawn to represent the shape of the mould, or the inside of the planking.

MAKING THE MOULDS

Now we can commence on the actual work of making the moulds, which are to be cut out of ⅞-inch spruce boards, making one for each station which we have drawn on the floor. We will take first the midship mould at Station 6 and explain that, the others being made in the same way. The scheme for transferring the shape of our section on the floor to the board from which the mould is to be cut is as follows: Take a number of small wire nails with flat heads and place the heads just on the line on the floor at intervals of three or four inches, sinking the head in slightly so that the nail will not roll out of position; place nails to mark the water line and center line in the same way, and also some to mark the ending at the sheer. After these nails have been carefully put in position lay the board from which the mould is to be cut on top of them and press it down firmly, so that the upper half of the nail heads will make an impression



Laying Down Midship Section

corresponding to the one which they make on the floor. Then turn your board over and strike a line through the points which you have, mark the water line, top of sheer ,and center line, and then cut out your mould, letting it extend two inches above the point marking the sheer for a purpose to be explained later. After the mould is cut place it on the floor to make sure that it corresponds exactly with the line on the floor, and if does not you must do the necessary trimming to make it fit exactly. When this half of your mould is completed cut another exactly like it, nailing the two together and trimming them as one. Nail the mould strongly together, as is shown in the sketch, being careful to get the width across the top very exact, and also to have the center lines fit closely together where they will rest on the keel. Make the other moulds in the same way, and then cut out of some thin wood a pattern for the stem, and also one for the stern transom.

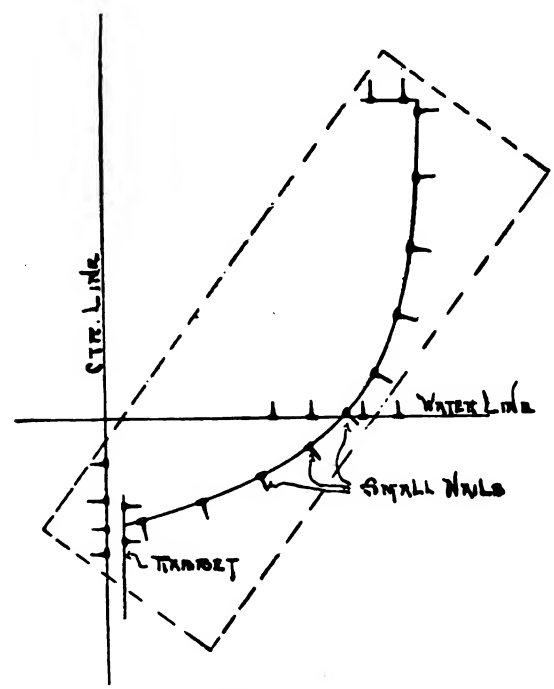
Next we must make a horse on which to lay the keel and form a solid foundation to build the boat on. This should be made from a two-inch plank sawn to exactly the sweep of the keel. It should be placed where you intend to set your boat up, and be set firmly on braces about two feet from the floor, it being placed so that the water line of your boat will be level. The stem should be sawn from an oak knee, so that the grain of the wood will follow its curve, and must be exactly two inches thick when finished smooth. The rabbet for the ends of the plank can be cut in the upper part, but it will be better to leave the part where it joins the keel until we get the boat set up, for then it will be much easier to see just how it should be cut.

The stern transom should be cut from a ⅞-inch oak board, making allowance at the top for rounding it up nicely when the boat is finished.

The keel must be made of a good, sound, clear, straight-grained piece of white oak that has been properly seasoned. It must be two and a quarter inches thick when finished, and shaped as is shown on the construction plan, making the top just ¾ inch inside of the rabbet line.

The shaft log will be made of oak in two pieces, with the joint on the center line of the shaft. By making it in this way we can cut half of our shaft hole out of each piece, then fasten them together, and we have our shaft hole very nicely and accurately cut. The log must be swelled, or made thick enough for the size of shaft you intend to use, but its upper and lower edges must be nicely worked down to the same thickness as the keel. The filling piece between shaft log and keel must be cut accurately to shape and be carefully fitted. The stern post is of oak bored for the shaft hole and swelled to the same thickness at the shaft log, and tapered above and below the shaft to the same thickness as the keel. It must be nicely fitted and morticed into both keel and stern timber.

The stern timber is of oak, two inches thick, shaped as is shown on the construction plans. Before getting out the keel, stern, deadwoods, etc., it is well to mark them



Transferring Line from Floor

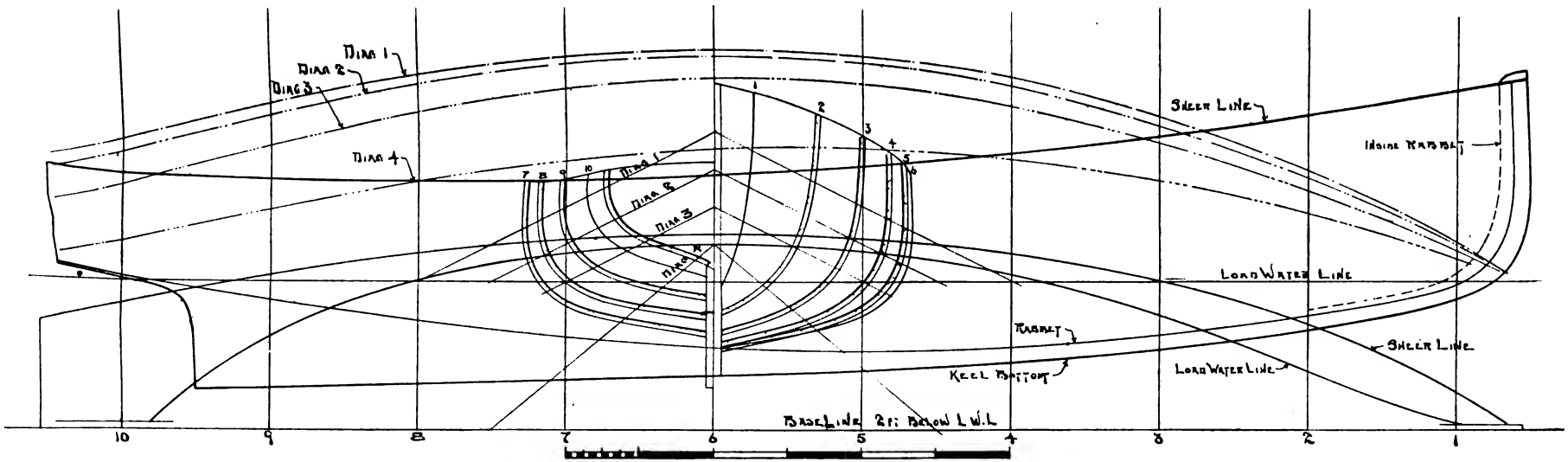
Laying Down Tables

Dimensions given in feet, inches & eights

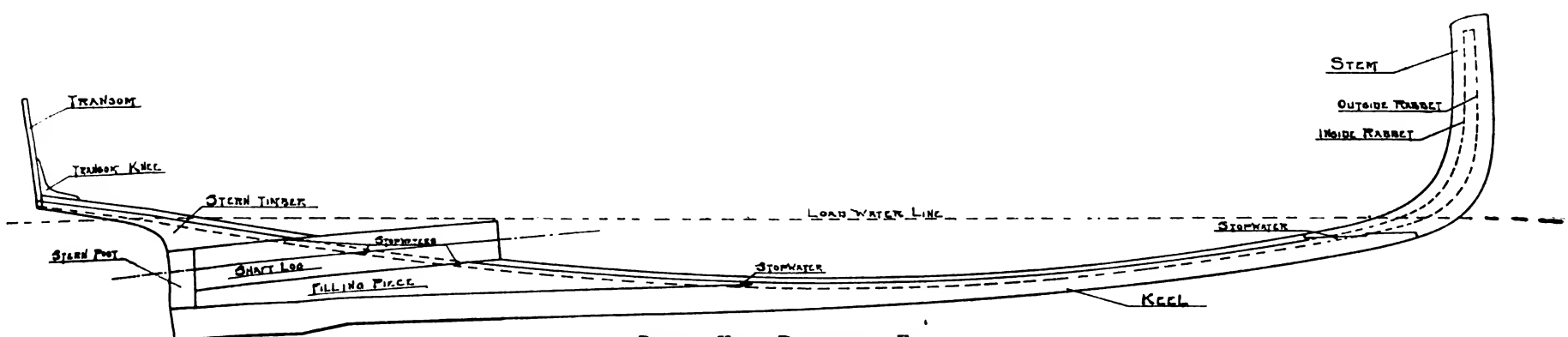
	Stations	1	2	3	4	5	6	7	8	9	10
Heights	Sheer Line	4.5.6.	4.2.3	3.11.3	3.8.6½	3.6.6	3.5.2	3.4.3	3.4.1	3.4.4	3.5.4
	Rabbet	1.11.4	1.6.6	1.3.3.	1.1.3	1.0.8	1.1.3	1.3.1	1.5.6	1.9.1	2.0.6
	Keel Bottom	1.9.0	1.4.0	1.1.0	0.10.7	0.9.4	0.8.6	0.8.1	0.7.3	0.6.6	2.0.2
	Diagonal 1	0.6.3	1.6.0	2.2.2	2.7.6	2.10.6	2.11.5½	2.10.6	2.8.2	2.4.2	1.11.1
	" 2	0.6.0	1.4.6½	2.0.7	2.6.4½	2.9.6	2.10.6	2.9.5½	2.6.7	2.2.4	1.9.0
	" 3	0.5.0	1.2.6	1.10.3	2.3.6	2.6.7	2.7.7	2.6.4	2.3.0	1.10.0	1.3.5
	" 4	0.3.6	0.11.1	1.4.3	1.7.7	1.9.5	1.9.5	1.7.5½	1.4.3	0.11.6	0.6.4.
½ Breadths	Sheer Line	0.6.2	1.5.2	2.0.2	2.4.5	2.7.0	2.7.6	2.6.7	2.4.6	2.1.1	1.8.4
	Load Water Line	0.1.2	0.9.6	1.6.6	2.1.2	2.5.0	2.6.1	2.4.6	2.0.2	1.3.1	

Diagonal 1 intersects Perpendicular 4' above Base Line and L.W.L 4' out
" 2 " " 3'-6" " " " " " 3' "
" 3 " " 3' " " " " " 2' "
" 4 " " 2'-6 " " " " Base line 3' "

Stations spaced 2'-0" Base Line 2'-0" below L.W.L.
All heights given above Base Line



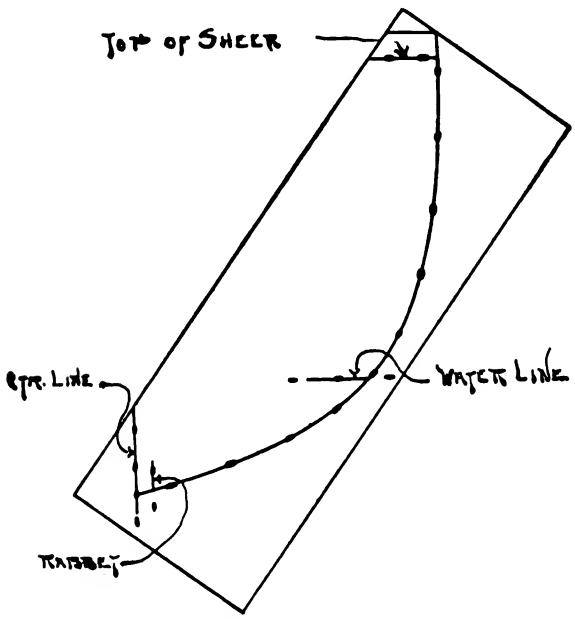
LAUNCH LAID DOWN



PLAN OF KEEL, DEADWOODS, ETC.

out on the floor, and then you can see just how they go and have a definite guide to work by.

The shaft log must be very carefully fitted and very tightly riveted together, with a strip of cotton or canton flannel in each joint. The stem, keel, shaft log and stern timber must all be very securely fastened together with galvanized rods riveted over washers. A piece of oak 4 inches wide must be fastened to the top of the keel to form a backing for the edges of the garboards. The transom is fastened to the stern timber by a small oak knee, as is shown on the drawing. The fastenings must all be very carefully bored for, so that they will fit closely and yet give no danger of splitting or of breaking the grain of the wood. The fastenings through the transom should be countersunk so that the holes may be plugged with a wooden plug.

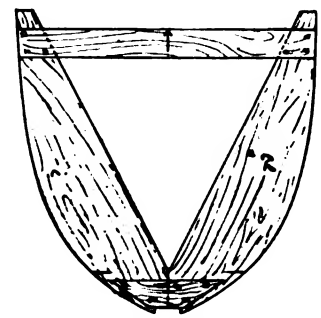


MOULD LAID OFF ON BOARD

SETTING UP

When the frame is completed and the stations plainly marked and numbered it can be placed in the proper position on the setting-up horse and be held firmly in place by a strong shore or brace from the top of your shed to the upper side of the keel. Small pieces of wood can be nailed to each side of the setting-up horse, with their ends projecting up on the keel, so that it cannot slip sidewise on the horse. When the keel is firmly braced we must brace the stem with diagonal braces so that it is exactly plumb and held firmly. The transom must also be braced so that its center line is plumb and it is level from one sheer line to the other.

Now as a check on the work we have done it will be well to stretch a line from the center to the stem head, to the center of the transom, and from this drop a plumb line to the keel amidships. If the plumb line



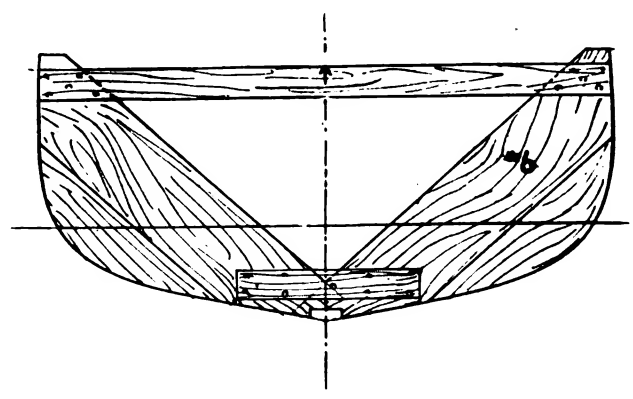
MOULD COMPLETED

strikes exactly on the center of the keel everything is quite right, but if it does not you must go back over the work and find the part that is out of true.

It is of the utmost importance to have everything absolutely true and exact here at the beginning, for if you are careless in your haste to get your boat set up and allow things to remain out of plumb you will have no end of trouble and extra work, for the boat will not be exactly alike on both sides. So be very careful and see that everything is as it should be and give a great deal of care and patience to the work of setting the boat up properly.

With the keel satisfactorily in place the next step is the moulds, and first we will take the midship one at station No. 6.

Before going any farther it may be well to say that for convenience in bracing your frame and moulds you must fasten a piece of wood 2x3 inches about 20 feet long to the ceiling or rafters of your shop, directly over the center line of your boat, and have it fixed firmly and rigidly, so that it will give a solid bearing for your



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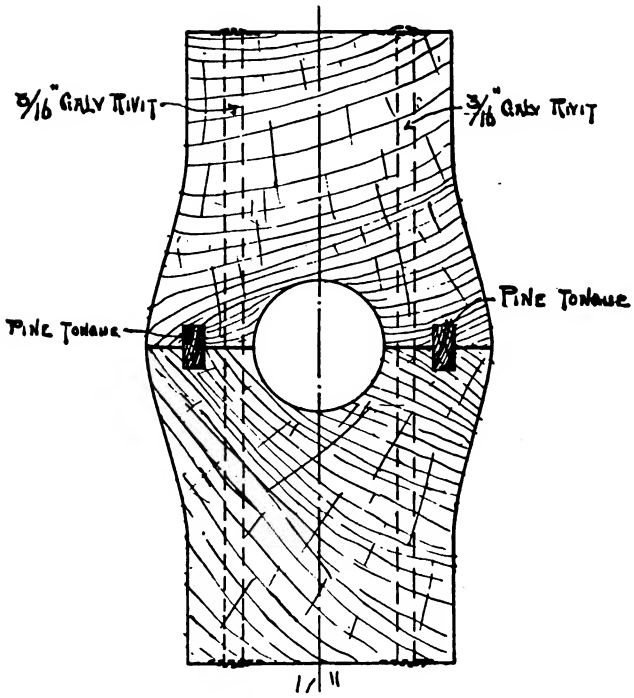
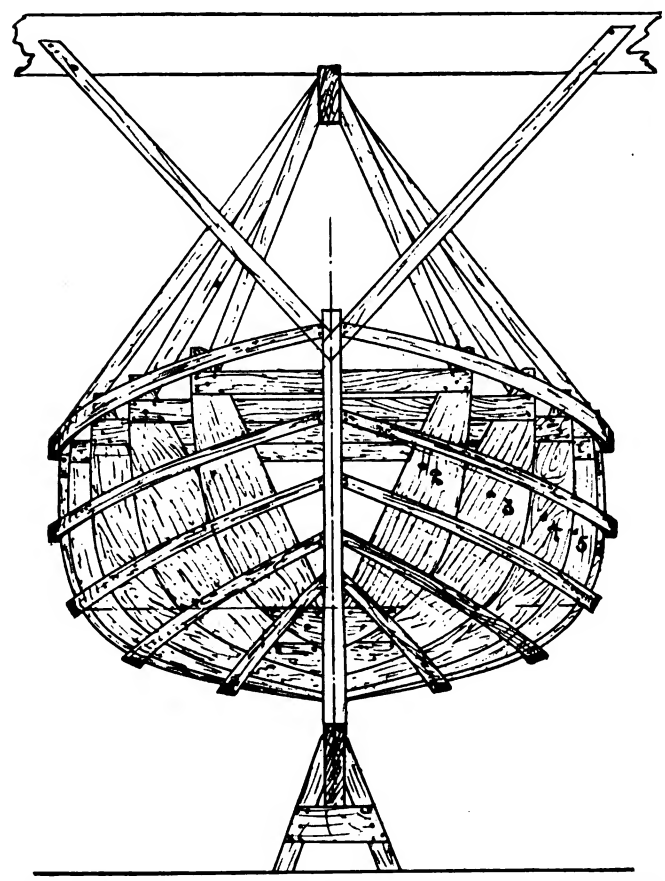


Section through Shaft Log

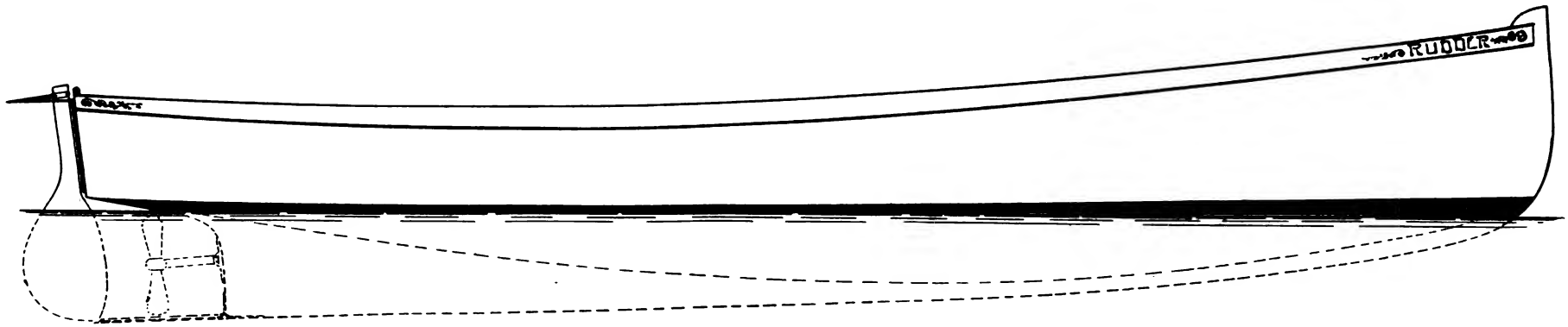
braces, etc. With this in place we can start to put our moulds in place. As you have marked No. 6 on your setting-up horse and also on your keel, and of course made these marks come together when you placed the keel on the horse, you have the exact location of your mould. Place a solid upright of 2x3-inch spruce from the top of your keel to your stringer overhead, having the forward side exactly on No. 6 and setting it perfectly plumb. Next place your mould on the keel, having the after side of the mould exactly on No. 6. Tack it to the keel and then tack your cross-piece to the upright after you have leveled it exactly. Next fasten diagonal braces of 1x2-inch spruce from either side of the mould up to the overhead stringer to hold it securely from being knocked out of level, and then square it with the center line of the keel and brace it in that position.

When this is securely fastened in position set up the other after moulds in the same way, and then start on the forward ones. The forward moulds must be set so that the *forward* side is exactly on the station, or else be beveled so that the planking will fit closely against the after side, if that side be placed on the station. If the mould were placed forward of the station and not beveled the boat would be fuller than she should be and not like the design. After all the moulds are set and securely braced perfectly level and square with the center line, take two spruce ribbands about 1½x2 inches and bend them around the sides of your boat, placing the LOWER edge exactly at the points on the moulds marking the sheer. If you have been careful and accurate in all your work these ribbands will strike all the points and run in a perfectly fair and true sweep. The object of placing this ribband above the sheer line is so that it may be kept in place to hold the heads of the frames while the top streak of planking is being fitted, and also so that it may be kept on after the moulds have been taken out, and until your clamps have been put in.

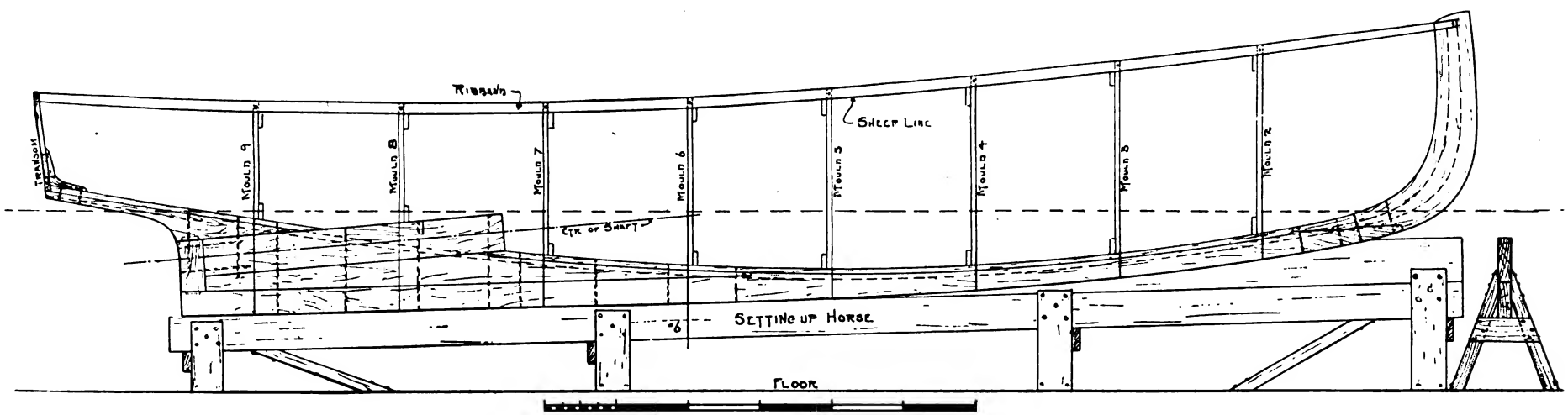
When these two ribbands are on properly you may give a sigh of satisfaction and feel content that you are well begun on your work, and if everything is as it should be the remainder of the work will go along without difficulties. Put on about four more ribbands of the same size on each side, spacing them as they are shown on the sketch, fastening them to the moulds with heavy screws, and then you are ready to begin bending your frames.



Bow View of Boat Set Up, Showing Braces and Ribbands



OUTBOARD PROFILE OF COMPLETED BOAT



BOAT SET UP WITH MOULDS IN PLACE

Framing and Planking

THE greatest difficulty to the amateur boat builder in bending frames usually lies in the fact that he does not get the proper kind of oak, and so has all kinds of trials in bending them. My advice is, go to the best boat builder near you, tell him exactly what you want the oak for, and let him get out the frames for you. They should be of tough, clear-grained white oak that is seasoned but not kiln-dried, so that the fiber of the wood has become brittle and lost it strength and toughness. The size is to be ¾x¾-inch, and they must be long enough to extend from rail to rail in one piece.

In order that your work may look finished and workmanlike you should smooth the frames up nicely and round off the corners which will show on the inside of the boat. To bend them, they must be thoroughly steamed in your steam-box until they can be easily bent to the shape required. It is sometimes the practice to bend the frames over a mould or form before putting them into the boat, but I have purposely placed the moulds closely together and had you put on plenty of good, heavy ribbands so that you can bend your frames directly into the boat. The frames are to be spaced 6 inches, so you must bend the proper number into each section, and perhaps a few extra ones in case any should split or become broken. In bending the frames have a man on either side of the boat, and when the frame is in place clamp the heads to the upper ribband on either side. After it has cooled a bit it can be tacked with a small wire nail and the clamps taken off for use on other frames. When all the frames are bent and cooled in shape they must be carefully spaced and fastened securely to the keel with brass screws. The heads of the frames should not be fastened securely as yet, as it may be necessary to slip them a trifle if a frame should be either too full or too slack to fit the planking fairly. When the frames are all in you are ready to begin planking, but first must finish cutting your rabbet forward. I have never been able to find any one who could explain this operation so as to make it clear, and doubt my own ability to do so, so will leave you to puzzle it out for yourself, as I did in my first attempt at boat building, and I feel sure that after a bit of hard thinking and a little piece of your planking to guide you in getting the proper bevels you will be able to see the thing for yourself much more clearly on the boat itself than I could possibly make it on paper.

Now for the mysteries of planking and spiling: First take a piece of pine or cedar long enough to go the full length of your boat, and about four inches wide, and plane it down to about ¼-inch thickness. We will get out the top streak first, as that will be easier to explain. Tack your thin plank, which we will call a "staff," to the moulds and stem just below the upper ribband, taking care not to spring it edgewise. Now set your compasses to some convenient distance and sweep a circle on your staff so that you may reset them if accidentally changed. Place one point of the compasses on the point on the mould marking the sheer line, and with the other sweep an arc on the staff. Do the same thing on each mould, and also from two or three points on the rabbet line of the stem, so that we may have the exact end of the plank. Mark also the outside of the transom on your staff for the after end of your plank. When these marks are made take off the staff and lay it to one side while you select a board from your lot of planking to cut your upper streak from. Cedar is the best material for the planking, and you should be able to get it in lengths long enough to get out your planks in one piece. The boards should be about ⅞-inch thick, to allow for dressing down and planing off after the boat is all planked, and must be sound and clear of all large or loose knots. It will be almost impossible to get cedar that is absolutely clear, and it is not necessary to try, as the small knots are in no way objectionable. Very often when there is a knot in a plank which cannot be avoided, and the builder does not want to throw away the whole board, he takes a good sharp bit and bores out the knot, leaving a smooth round hole, into which he drives a bung of the same material as his board, using a little shellac or varnish to make sure of its staying in place, and taking

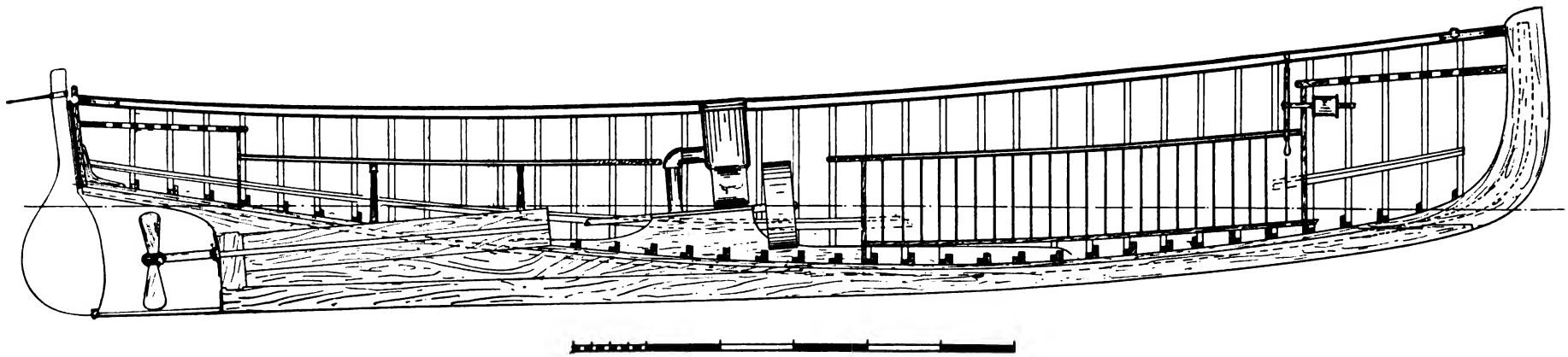
care that the grain of the bung runs the same as the grain in the board. When this is smoothed off and painted it can never be seen.

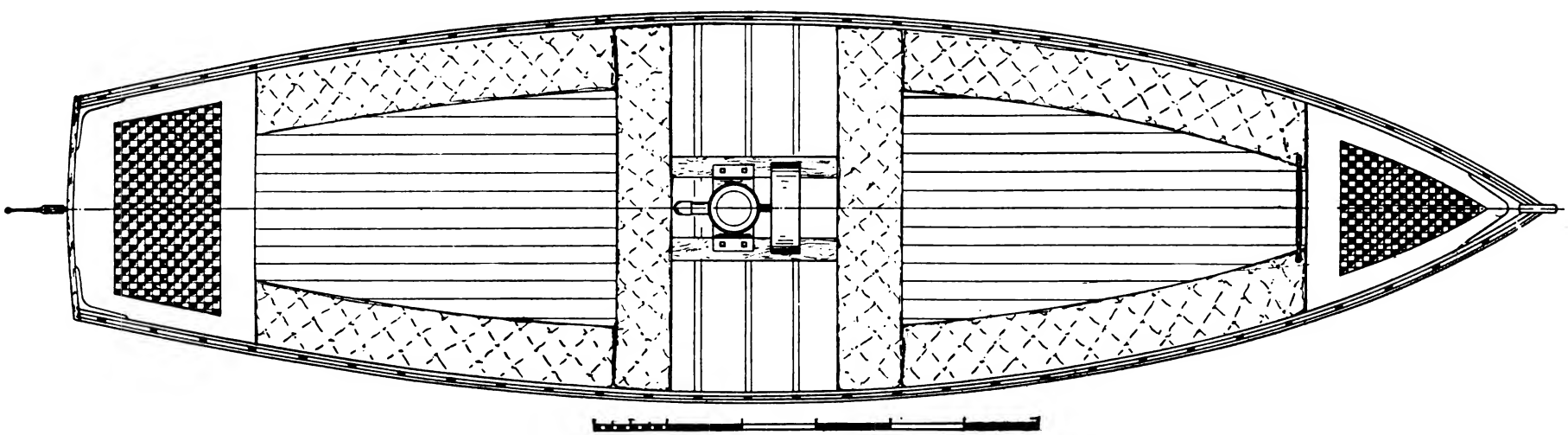
When a suitable board, one that will not cut to waste badly, is chosen, place your staff upon it and secure it in place by a couple of tacks. When the staff is properly adjusted on the board we will transfer the points from the staff to the board. To do this, again take your compasses set at the same radius, and with any point on one of the arcs on the staff as a center sweep an arc on the board; then take another point on the same arc on the staff and sweep another, intersecting the one already made on the board. The intersection of these two will correspond to the point from which the arc on the staff was originally swept. This must be done to every arc you have on the staff, and you will then have a series of points on the board which will mark the upper edge and the ends of your first plank. Now remove the staff and with your long batten mark out the upper edge of your plank. Next mark out the lower edge, making the plank 3¾ inches wide in the middle, 2½ inches at the stem and 2¼ inches at the transom. Saw this out, plane up the edges, round out the inner side to fit the moulds with a plane adapted to the purpose, fit the forward end very closely into the rabbet, and the plank is then ready to put in place, after first having cut out a duplicate to it for the other side. In putting it on fasten it first to the stem with brass screws, and then spring it in against the moulds, tacking it to each just enough to hold it in place. By starting your planks at the stem you are always sure of having a good joint there. After getting the top plank on the other side, you can go about getting out the plank below it in exactly the same way, tacking on your staff and taking the marks with your compasses exactly as before. This plank must be 3¼ inches wide in the middle and 2 inches at the ends. The seam between the two must be very tight and close on the inside and open about 1-16-inch or less on the outside for calking. Do not hurry the planking, but take plenty of time and have all the seams and joints fit exactly as they should, for even paint and putty will never cover up a poor job of planking.

When these two planks are on and fastened to the stem and transom with brass screws with their heads countersunk and tacked lightly to the moulds, you will have gotten enough idea of planking to start on your garboards and work up from them the rest of the time.

You may have to plane down your staff in order to bend and twist the forward end into place against the stem, but when it is in place you can take your spiling for the edge which fits against the keel in the same way as before. When the staff is in place it will also show you whether you have the rabbet cut properly at the stem and forward end of the keel. Make the garboard 5 inches wide amidship, 3 inches wide at the aft end and 3 inches at the forward end. The garboard will probably have to be steamed before it can be put in place, but before it is put on we must put in some stop-waters to prevent the water following the scarphs of our keel and deadwood and thus finding its way into the boat. The stop-waters are simply dowels of dry white pine about ⅜ inch in diameter, driven clear through the keel, where they are shown on the construction plan. When the boat is in the water these plugs swell and thus stop any water that may work into the scarph. When the stop-waters are in—and they must not be forgotten—you can finish fitting your garboard and then fasten it in place, commencing at the stem, as before. This can be tacked to the molds to hold it in place, and then fastened to each frame. The fastenings in the frames are to be copper nails, and they must be carefully bored for and a countersink bored for the head. If the nail heads are to be bunged with wooden plugs instead of being covered with putty, the countersinks must be carefully bored with a ⅜ bit to just the right depth, say about ¼ of an inch. If the ordinary copper boat nails are used they should be about 2 inches long. They must be driven through, countersunk, and the burr driven down into place; then the end is cut off and the nail headed up over the burr. There must be at least two fastenings in every frame for each plank, and they should be placed about one-half or three-quarters of an inch from the edge of the plank. When your garboards are on you must figure out how many planks will be needed to fill the remaining spaces, and decide how wide each shall be at the middle and also at each end. In general you can make your planks fairly wide (say 5 or 6 inches) amidship on the bottom of the boat where there is but little curve to the frames, but at the turn of the bilge they must be quite narrow and be hollowed on the inside to fit the frames, as it is impossible to bend a plank longitudinally to fit the side of the boat and at the same time bend it transversely to fit the curve of the frame.

The ends of the planking at stem and stern should be as near uniform widths as possible, as it looks badly to see a wide plank with a very narrow one on either side of it. It is best to have all the planks run full length if possible, but in case it is necessary to make a plank in





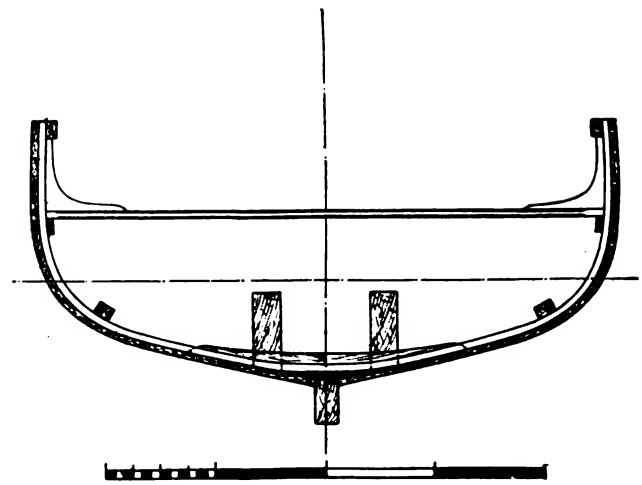
PLAN AND ELEVATION OF INTERIOR

two pieces the butt should be made on a block between the frames on the inside of the plank, and each end securely riveted to it. After the boat is all planked and riveted she can be planed off roughly, and then left for the final smoothing up after the moulds are out. Before taking out the moulds we must fit in a floor for every frame, fastening it to the frame, keel and planking. These floors should be worked out of 1-inch oak, with a natural crook, if possible, and very carefully fitted and fastened. A small opening, or limber, must be cut in the under side of each near the keel to allow water to run aft, so that it may be pumped or sponged out. When the floors are all in and fastened, we can take out the moulds, leaving the upper ribband still on, and nailing on a few cross ties to keep the boat from spreading while we are putting in the clamps.

The clamps should be of oak about 7/8x2 inches, neatly tapered at the ends and having a beading cut on the inside face. This must be riveted to the inside of the frame heads, having its upper edge the same height as the top of the sheer strake. The spaces between the frames may be left open, or they may be filled with pieces of oak or mahogany. There are various other ways in which the rails may be finished, but for practical use it is well to leave the spaces between the frames open, so that the boat may be tipped up on her side and thoroughly cleaned out when necessary, the open rails allowing the dirt to be washed out easily.

Some may prefer a little deck forward and aft, with a low coaming running around the cockpit, but any one who has built the boat up to this stage will surely need no instructions about putting on the deck and steaming and bending the coaming.

In each bilge we will run a bilge stringer of oak about 2x1½ inches tapered slightly at the ends. This should extend well into the ends of the boat and be riveted through planks and frames.

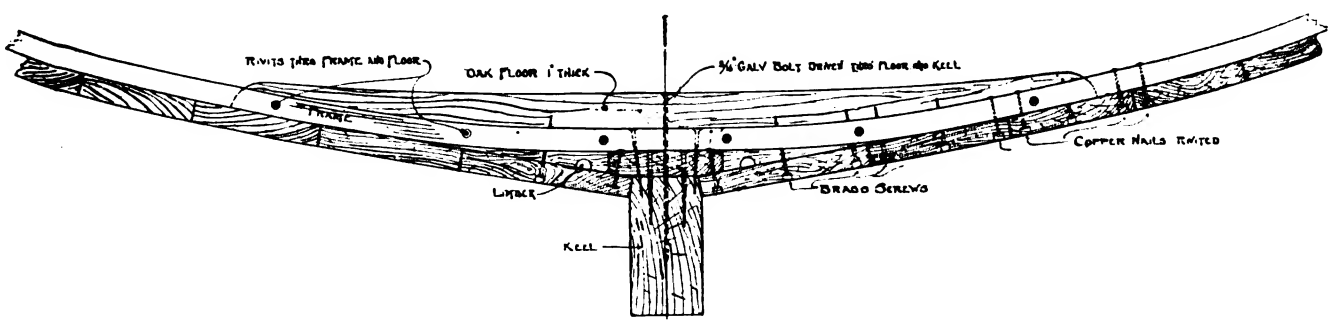


MIDSHIP SECTION

In regard to the engine bed, it is hard to give any one method as the best, as different makes of engines require different foundations. In general it is well to have good heavy logs, extending well forward and aft of the engine, carefully fitted over frames and down on to the planking. They should be very well braced transversely to resist the side vibration of the engine. Another good way is to put in oak cross floors, one to every frame, and on top of these bolt two-inch oak planks to form the engine bed. The chief point is to distribute the weight and jar of the engine over as much space as possible.

The usual arrangement is to place the fuel supply tank for the motor in the bow, the muffler in the stern, and the batteries amidships beside the engine. The details of putting in seats, lockers, floors and gratings are all too simple to need explanation, and any good workman with a fair amount of ingenuity will find no difficulty in finishing the boat in a neat and shipshape manner.

Before being painted the boat should be calked, and to do this requires considerable experience and skill. To be done properly I would recommend the amateur to secure the services of a professional, and then you will feel confident of a good tight boat. If you are forced to



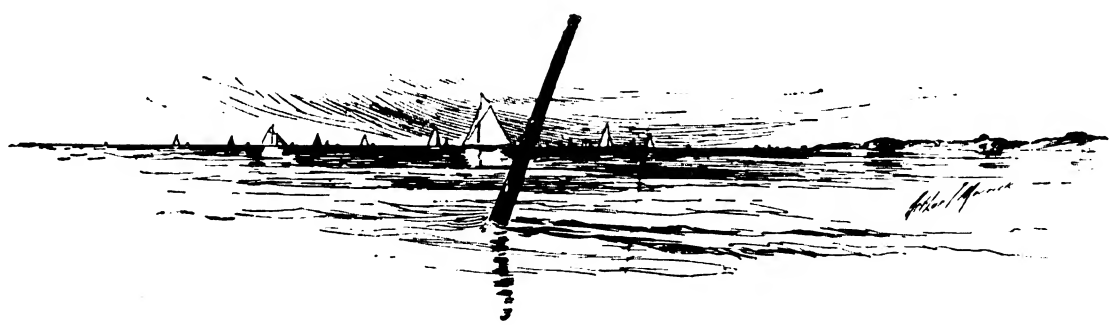
SECTION SHOWING CONSTRUCTION OF KEEL AND FLOORS

do the calking yourself, you must get a quantity of the soft, untwisted calking cotton and the smallest calking iron that you can buy. A good stout putty knife can be used for driving in the cotton, but a regular iron with a thin blade will be much better. Do not lay the cotton in the seam in a straight string, but give it a sort of a roll and a twist, gathering back a little loop every time you drive the iron into the seam. First just start the cotton into the seam with a light blow on the iron, and when you have a short distance done in this way, go back over it again, driving it firmly and evenly down into the seam, leaving about 3-16 of an inch for puttying. When the calking is completed each seam must be painted, or payed, as it is called, with thick paint and a stiff, narrow brush, allowing the paint to soak well down into the cotton. This will hold the cotton and also make the putty stay in the seams.

When the calking and paying is done, you may proceed to finish smoothing up the boat by planing the planks off and then going over them with scrapers and sandpaper until the whole surface is perfectly fair and smooth and ready for painting. First a priming coat of white lead and oil should be put on and allowed to dry thoroughly and be rubbed down before the second coat is put on. The top sides should have three coats of good white paint, and the bottom a couple of coats of some good anti-fouling marine paint. The oak which is to be finished bright must be scraped clean and given two or three coats of good spar varnish.

The rudder is of oak and is hung on a rod or slide hanging on the transom and has its lower end supported by either a bronze or forged galvanized iron brace fastened to the stern post and keel. There are various ways of rigging the steering gear, but as good and simple a way as any is to fit a little tiller over the rudder head with the arm pointing aft, and carry the tiller ropes from this through a lead on either side of the transom, and then forward just inside the rail, below the clamps, to the steering wheel in the bow. An extra steering wheel may be placed amidships beside the engine, so that one man can both steer the boat and run the engine if necessary.

There are, of course, a great many little ways in which a good mechanic and careful workman can add greatly to the appearance of the boat by finishing her off nicely with mahogany trimmings, brass fittings and perhaps a top streak of oak finished bright with the boat's name and a neat little scroll carved on each bow, but even if the boat is finished in the plainest manner she will look well and attract favorable comment on account of her well-turned hull and general appearance of common sense and usefulness.

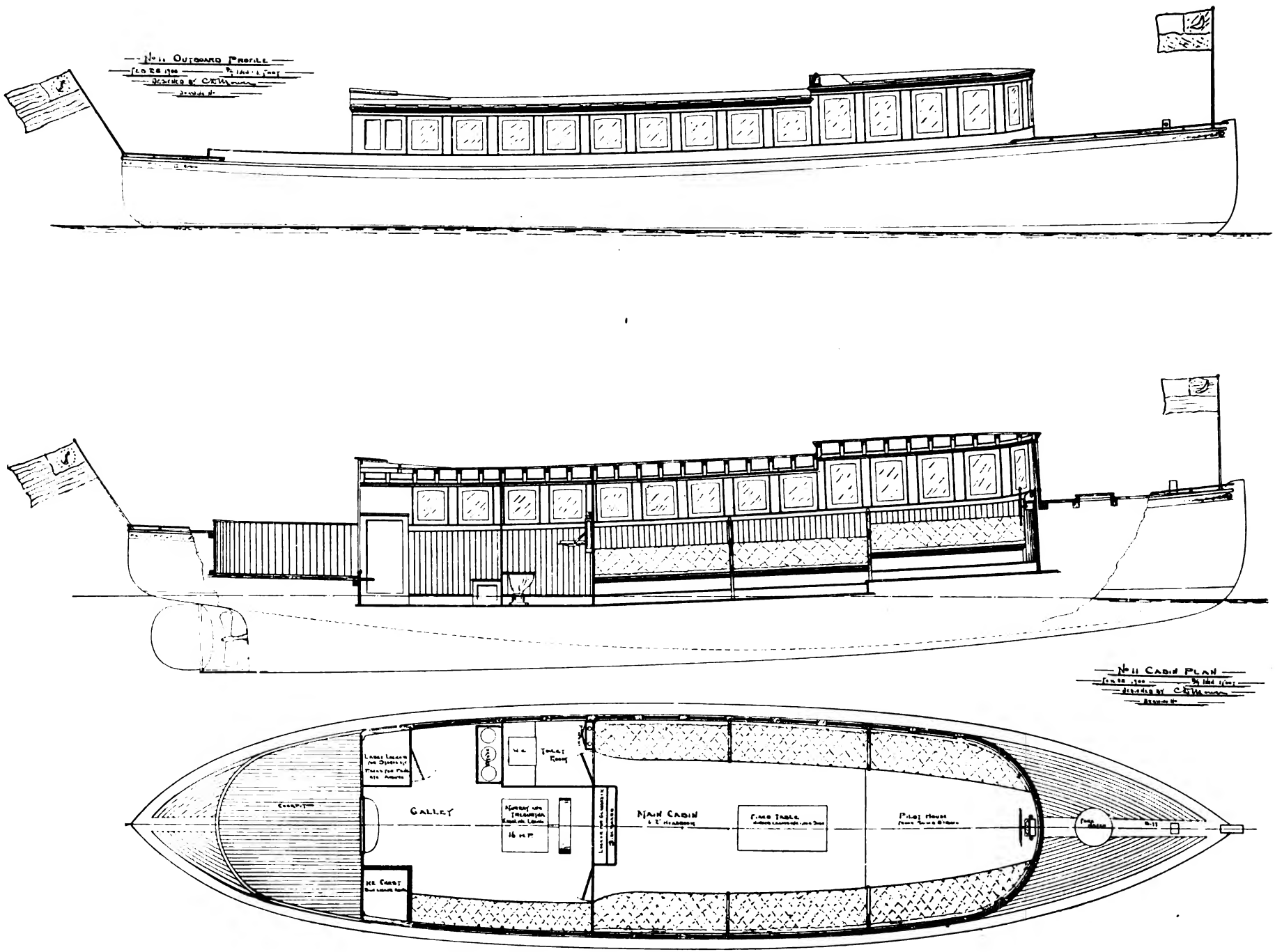


PART II.

LAUNCH DESIGNS

FROM

THE RUDDER



50-Foot Cruising Launch, Designed by C. D. Mower

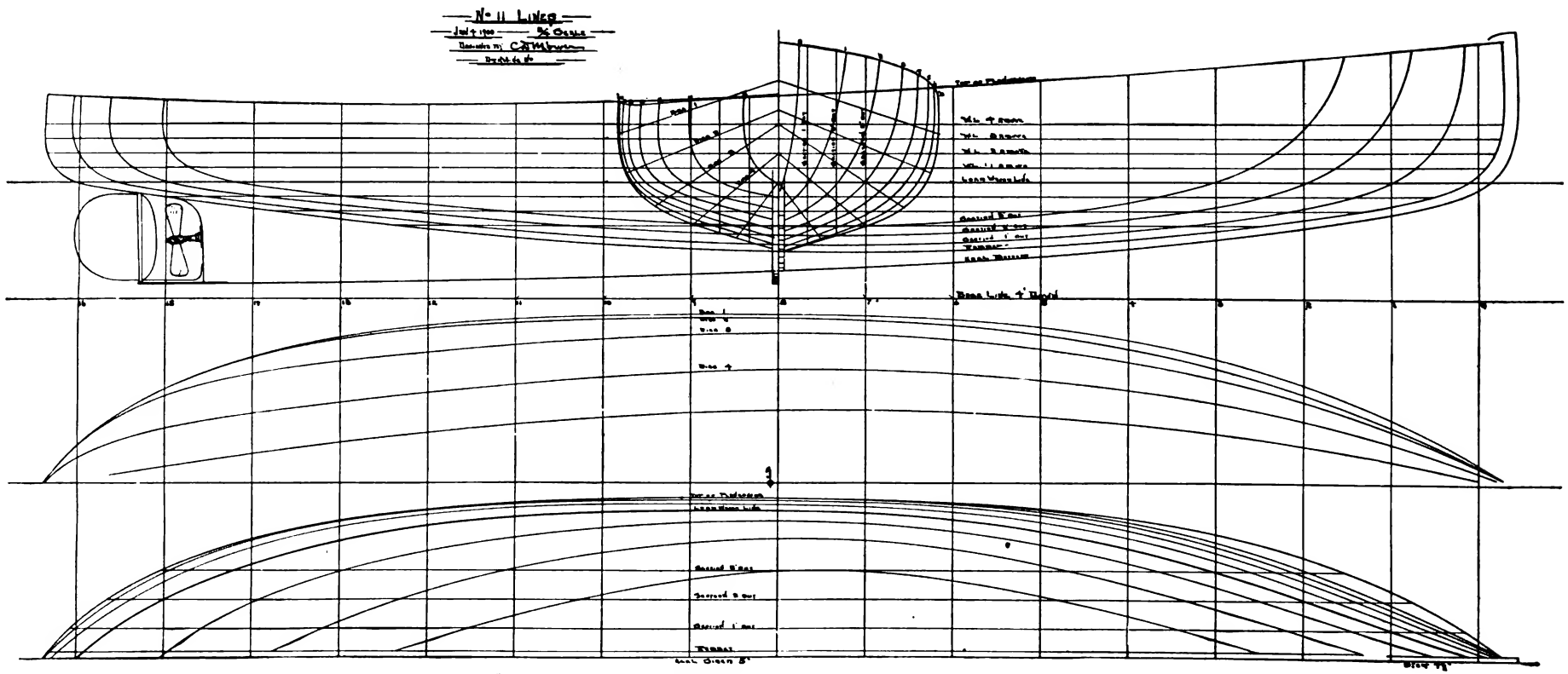
FIFTY FOOT CRUISING LAUNCH

ARLINE

DESIGNED BY C. D. MOWER

Length, over all	50	feet,	7 inches
water line	48	" 6	"
Beam, deck	11	" 0	"
water line	10	" 1	"
Freeboard, stem	4	" 10	"
stern	3	" 0	"
least	2	" 8	"
Draught, extreme	3	" 6	"
to rabbet	2	" 5	"

Power . . . . . 16 H. P., Murray & Tregurtha Motor
Speed . . . . . 8½ miles per hour



LINES OF 50-FOOT CRUISING LAUNCH, DESIGNED BY C. D. MOWER

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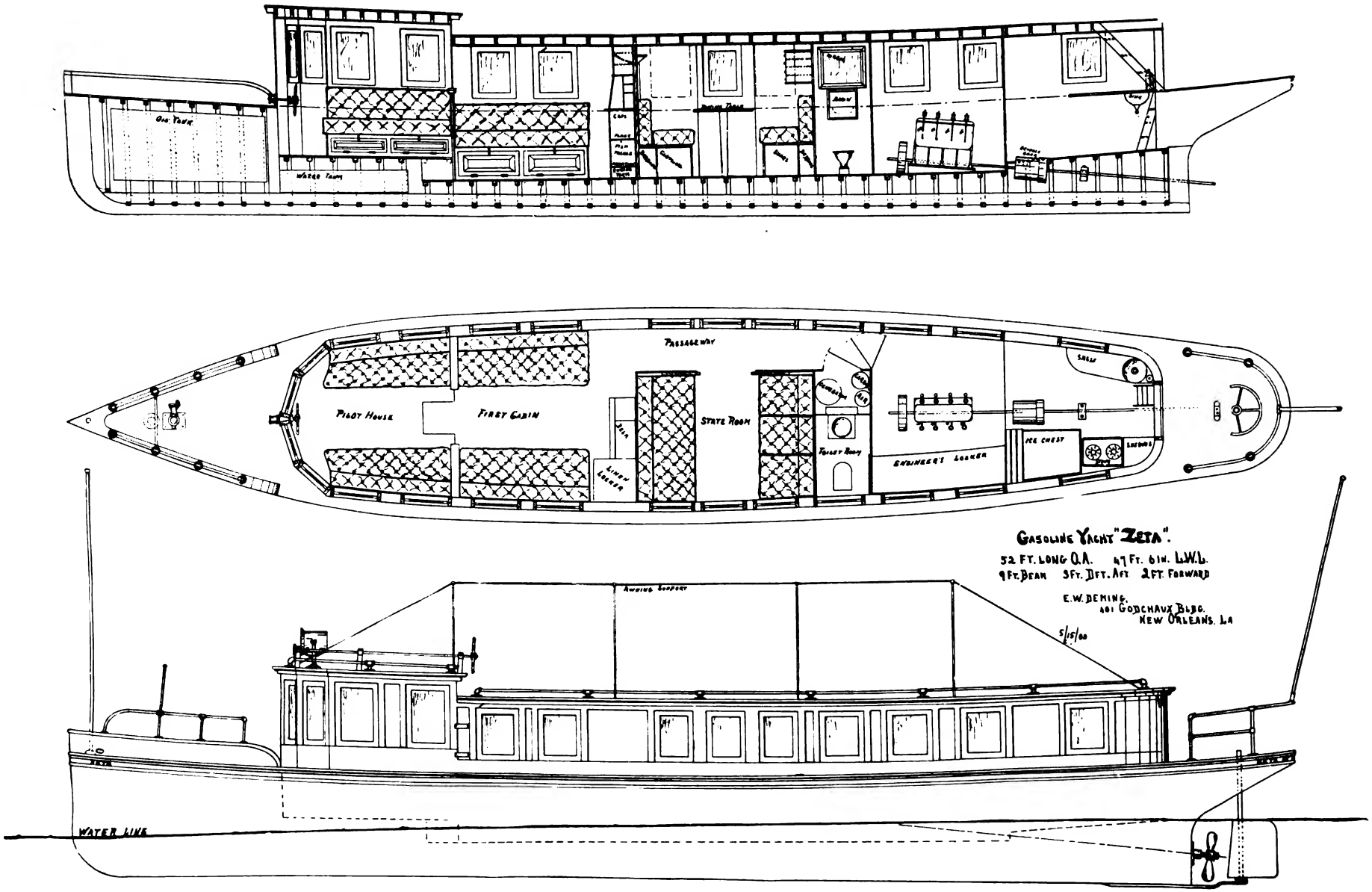
FIFTY-TWO FOOT CRUISING LAUNCH

ZETA

Length, over all	52	feet,	0	inches
water line	47	"	6	"
Beam, deck	9	"	0	"
Freeboard, stem	4	"	0	"
stern	3	"	0	"
least	2	"	4	"
Draught, extreme	3	"	0	"
at bow	2	"	0	"
Power	24 H. P., Gardner Motor			



CRUISING LAUNCH, ZETA

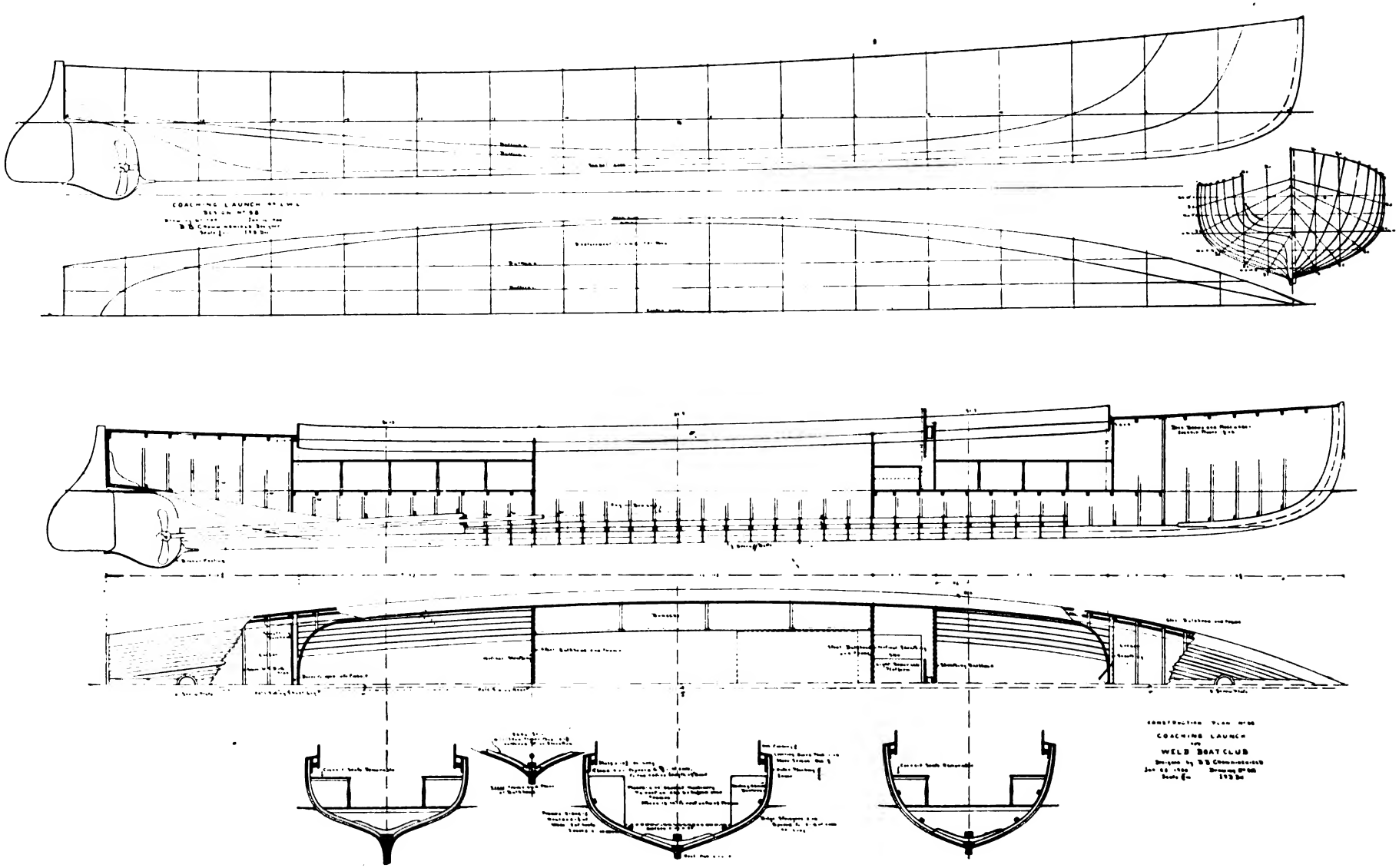
COACHING LAUNCH

VERITAS

DESIGNED BY B. B. CROWNINSHIELD

Length, over all	51	feet,	0	inches
water line	49	"	0	"
Beam, deck	7	"	9	"
water line	7	"	4	"
Freeboard, bow	3	"	6	"
stern	2	"	4	"
least	2	"	0	"
Draught, extreme	2	"	6	"
to rabbet	2	"	2	"

Power . . . . . Seabury Engine and Water Tube Boiler



COACHING LAUNCH VERITAS

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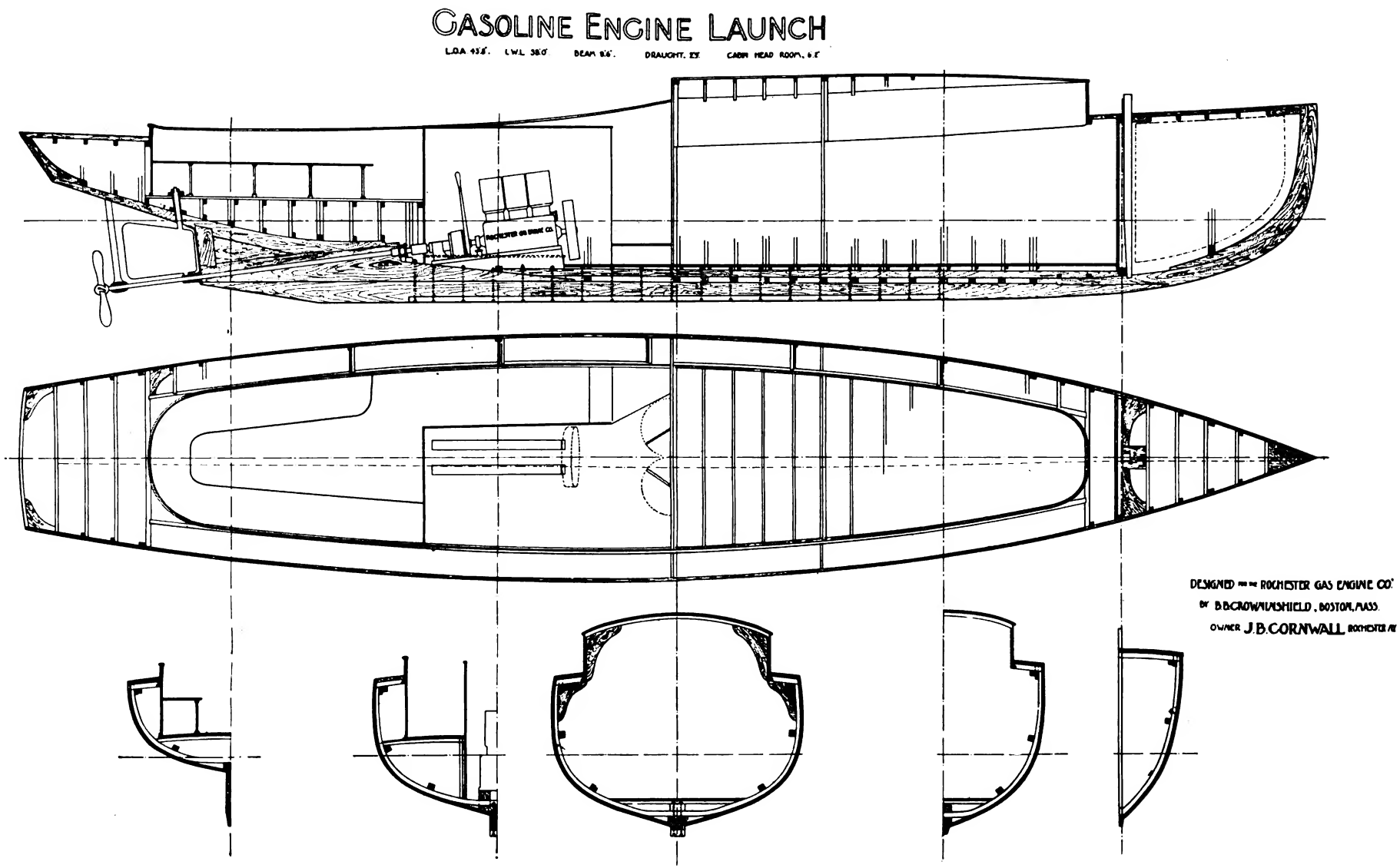
CRUISING LAUNCH

ANNA

DESIGNED BY B. B. CROWNINSHIELD

Length, over all	43	feet,	8 inches
water line	38	"	0 "
Beam, deck	8	"	5½ "
water line	8	"	2 "
Freeboard, bow	3	"	10 "
stern	2	"	10 "
least	2	"	6 "
Draught, hull	2	"	9 "
to rabbet	2	"	5 "

Power . . . . . 18 H. P., Rochester Gas Engine



CRUISING LAUNCH, ANNA

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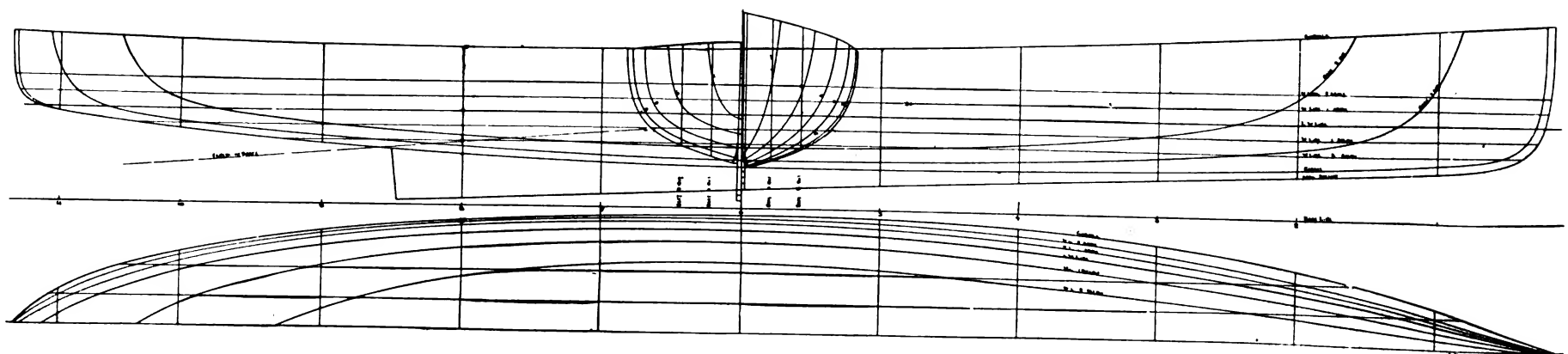
COACHING LAUNCH

JOHN HARVARD

DESIGNED BY GEO. LAWLEY & SONS CORP.

Length, over all	51	feet,	0	inches
water line	49	"	9	"
Beam, deck	7	"	10	"
water line	7	"	0	"
Freeboard, bow	3	"	6	"
stern	2	"	6	"
least	2	"	2	"
Draught, extreme	3	"	0	"
to rabbet	1	"	9	"

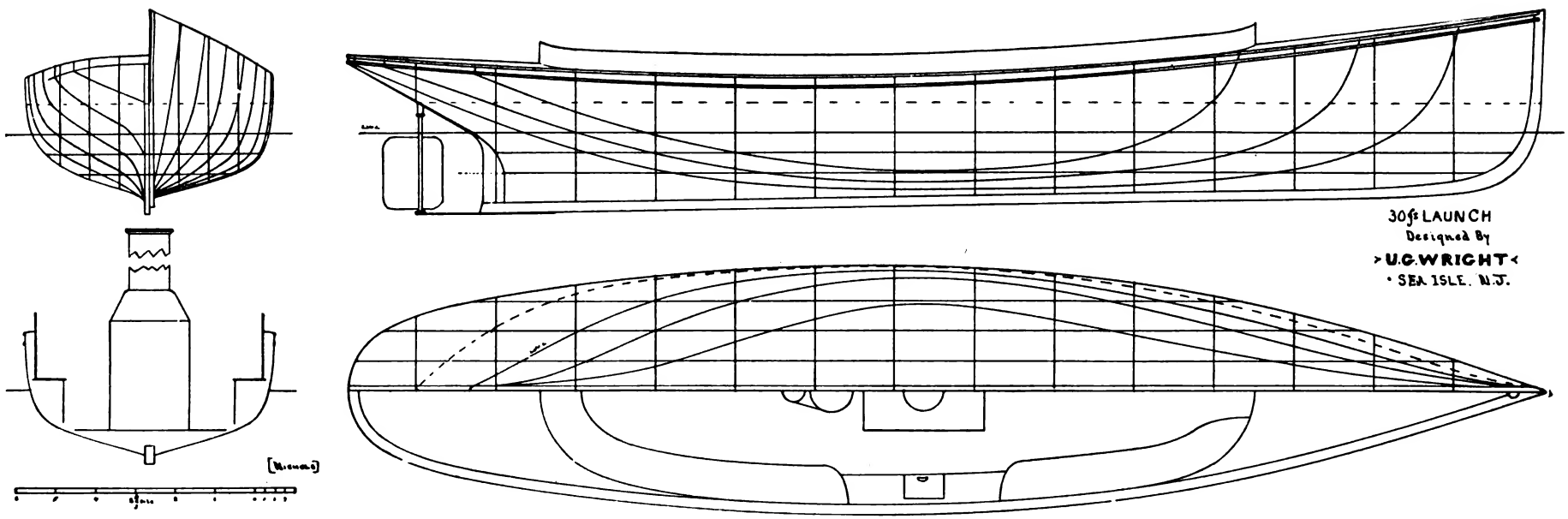
Power . . . . . Lawley Engine and Water Tube Boiler



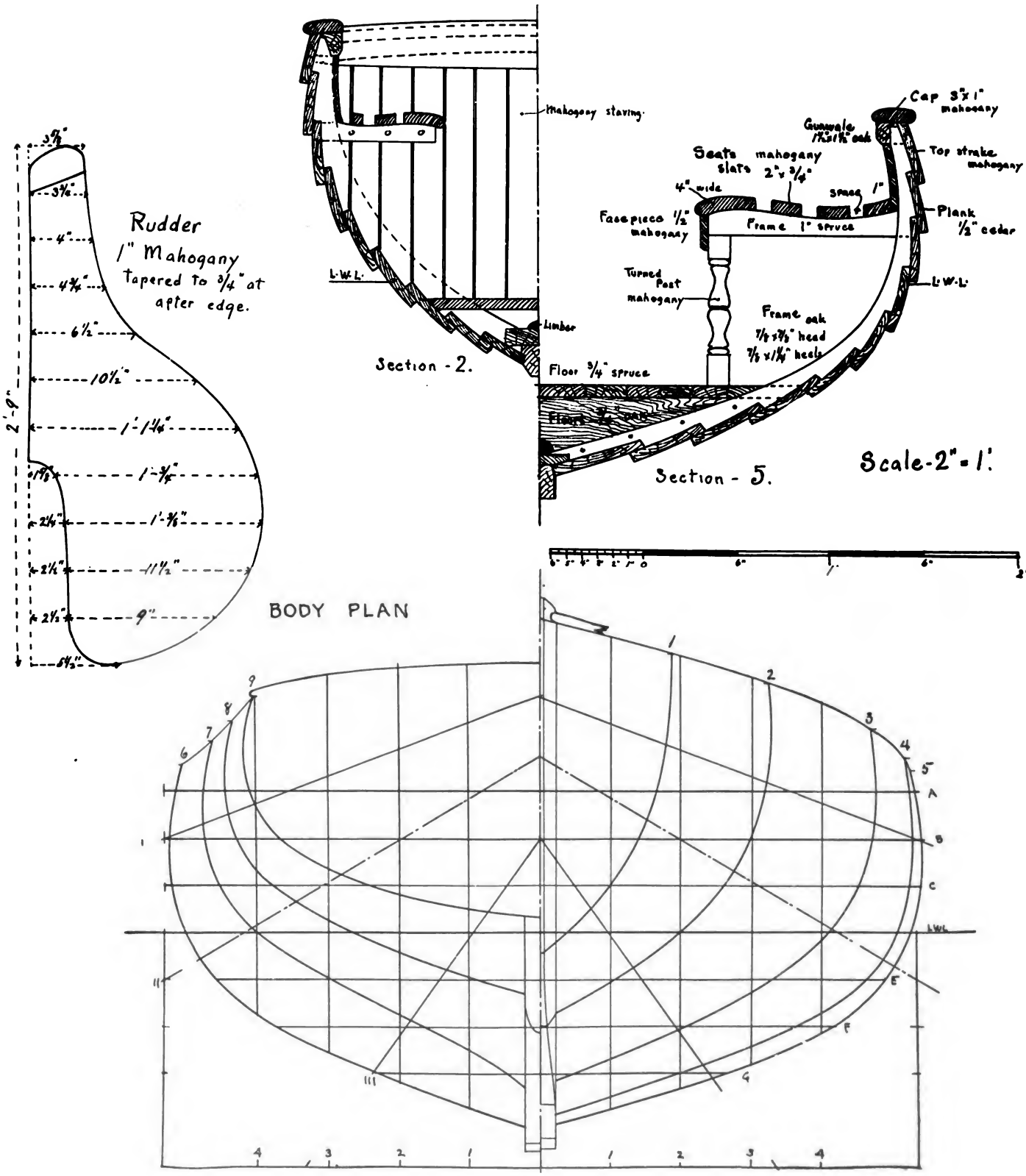
COACHING LAUNCH, JOHN HARVARD

POWER DINGEY

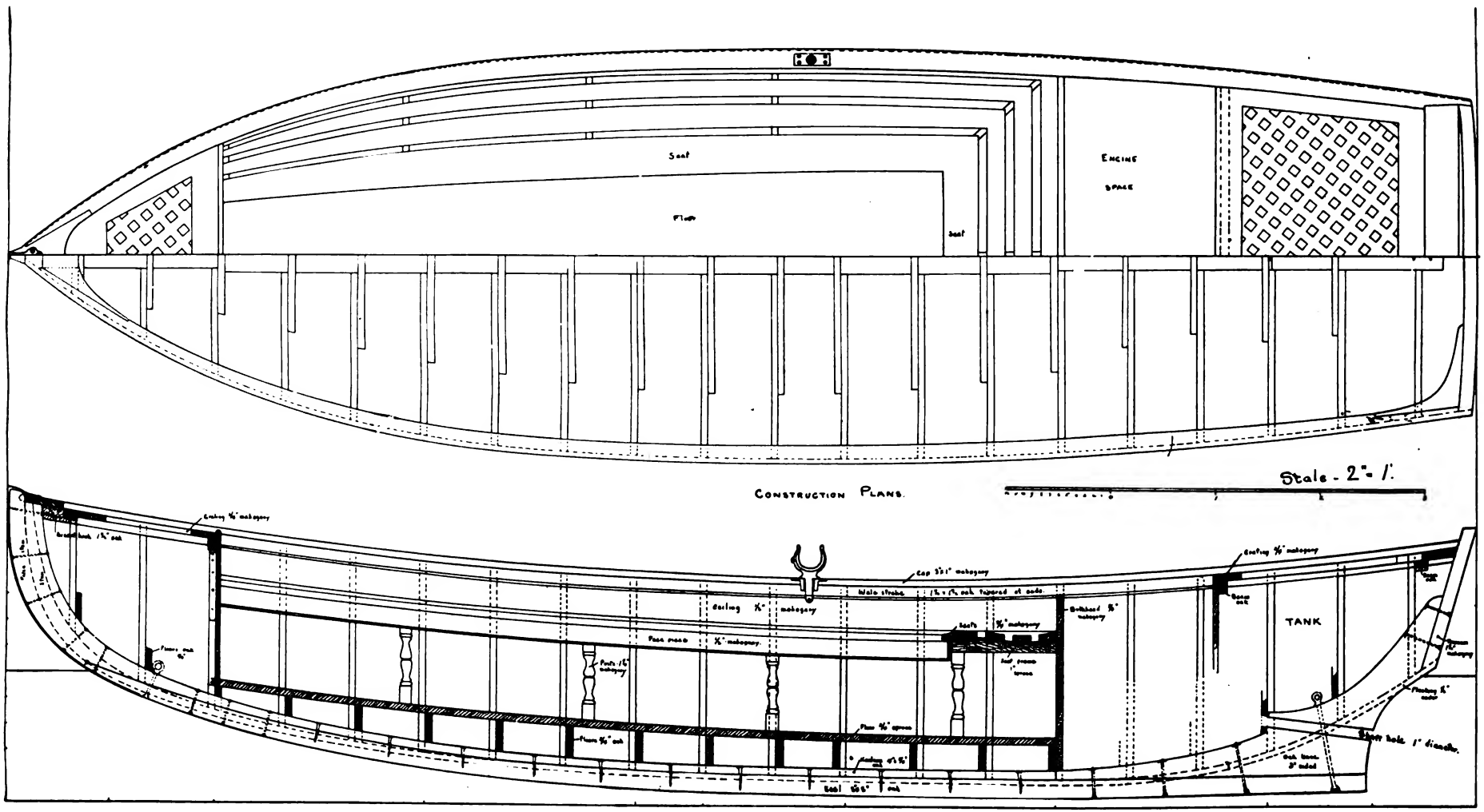
Length, over all	14	feet,	0 inches
water line	12	"	8 "
Beam, deck	4	"	0 "
water line	4	"	0 "
Freeboard, bow	1	"	9 "
stern	1	"	4 "
least	0	"	11 "
Draught, extreme	1	"	2 "
to rabbet	1	"	0 "



THIRTY FOOT OPEN LAUNCH



POWER DINGHY



POWER DINGHY